

Ambition and the Female Mathematician

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I am a researcher in **Number Theory**, but I did not intend to be a mathematician, especially a *research* mathematician.

EDUCATION

1976-1977: Undergraduate, UC San Diego, California
(my major changed frequently)

1979-1982: Undergraduate, Sonoma State University, California
Major: Management (Accounting emphasis)
Add-on major after one semester: Mathematics
BA (Management/Mathematics, 1982)

1982-1987: Graduate student, Dartmouth College, New Hampshire
AM (Mathematics, 1984)
PhD (Mathematics, 1987)

EMPLOYMENT

1987-1989: **Assistant Professor**, St Olaf College, Minnesota

1989-1990: **Assistant Professor**, Bates College, Maine

1990-1995: **Assistant Professor**, University of Colorado - Boulder

1995-2001: **Associate Professor**, University of Colorado - Boulder

2001-2007: **Professor**, University of Colorado - Boulder

2007-present: **Reader**, University of Bristol, England

CONCURRENT POSITIONS AFFORDING OPPORTUNITIES

Opportunity to grow as a mathematician:

1997-1998: Visiting Associate Professor, UC Berkeley, California
(fully supported by the National Science Foundation; only taught one course -- a graduate course with topics of my choosing)

Opportunities to help me relocate:

2000-2002: Program Office (full-time) Nat'l Science Fnd, Virginia

2004-2006: Department Chair, University of Colorado - Boulder

What is *ambition*?

- **Ambition**: A strong feeling of wanting to be successful in life and achieve great things.
- **Ambitious**: Having a strong desire for success.
- **Success**: The achievement of something planned or attempted; attainment of fame, wealth, or power; somebody of significant achievement.
- **Significant**: Meaningful; momentous and influential.

WHAT SORTS OF AMBITIONS DO *MATHEMATICIANS* HAVE?

- **fame and fortune** (winning prizes; proving famous conjectures; making famous conjectures)
- **solving hard, interesting problems**
- **constructing elegant proofs**
- **successful expositor** (written and/or spoken)
- **successful teacher**
- **advancing in administration**
- **happiness, fulfilment**

Women mathematics are not very visible

- **Few women teach us mathematics**, especially at the research level (in the US, at the rank 1 universities, 25% of the math's grad students are women, but 8% of the math's tenured faculty are women).
- **We see even fewer women at conferences.**
- **Very few of the women at conferences give talks** (especially the celebrated talks).
- **Almost no prizes and grants are awarded to women** (in the US, few women even apply for grants for mathematical research).

... *she'd simply watched her world shrink and shrink, while her bothers' worlds expanded.* -- Andrea Barrett, from **The Voyage of the Narwhal**, a tale of arctic exploration in the 1850's

Our cultures tend to condition women to be **less ambitious**.

Little girls get **baby-dolls**, while little boys get **chemistry sets**.

In fairy tales, the women and girls are typically in the control of their husbands, fathers, and brothers. How often are these females **helpless**? How often are they **heroes**?

There are common sayings that cast women as less **reliable**, less **robust**, such as:

A woman's prerogative is to change her mind.

In discussion, women are often denied the opportunity to speak.

(Although a few years ago, a woman mathematician told me, in all seriousness and with reverence, about a study done by some professors at Stanford, in which they ``concluded" that **women can be full participants in a conversation by laughing at the right times.**)

[There is a] cultural distortion which warps women's lives and suffocates individuals under a weight of stereotypes.

-- Joan Smith, from **Misogynies**

A common story:

At a committee meeting, a **woman** makes a suggestion that is immediately denigrated or ignored.

Some time later, a **man** makes the same suggestion -- suddenly, that idea is brilliant! (But hardly anyone remembers that this idea had already been suggested by the woman.)

I've heard:

"She's far too pretty to be a really good mathematician."

And I've heard ambitious women described derisively as *"aggressive"* and *"unfeminine"*, while their ambitious male counterparts are described respectfully as *"assertive"* and *"serious"*.

I've known women who try to combat these stereotypes by trying to look and act like men – but everyone knows they are women.

I'm not sure whether imitating men has helped them be accepted into the predominantly male mathematics “club”, but I believe we hurt ourselves when we deny who we are.

[She] who trims [herself] to suit everyone will soon whittle [herself] away. -- Raymond Hull (playwright, screenwriter, lecturer)

Women in mathematics face a lack of role models, of opportunity, and often, of confidence.

There are so many ways women are told they are less capable than men, it's easy for women to get discouraged and to set their ambitions low.

But imagine your life and career as a video game; press that magic button that removes all the obstacles. Now ask:

What do I want to accomplish?

Years from now, where do I want to be?

Twenty years from now you will be more disappointed by the things you didn't do than by the ones you did. So throw off the bowlines, sail away from the safe harbor, catch the trade winds in your sails. Explore.

Dream. Discover. -- Mark Twain, humourist and novelist

Sometimes when working, you might think that mathematical research is not your **passion**. But it's important to identify and separate the contributing factors:

Is it the social climate you are in?

Is there a particular person who seems determined to make you feel miserable and small?

Is it the particular problem you are working on?

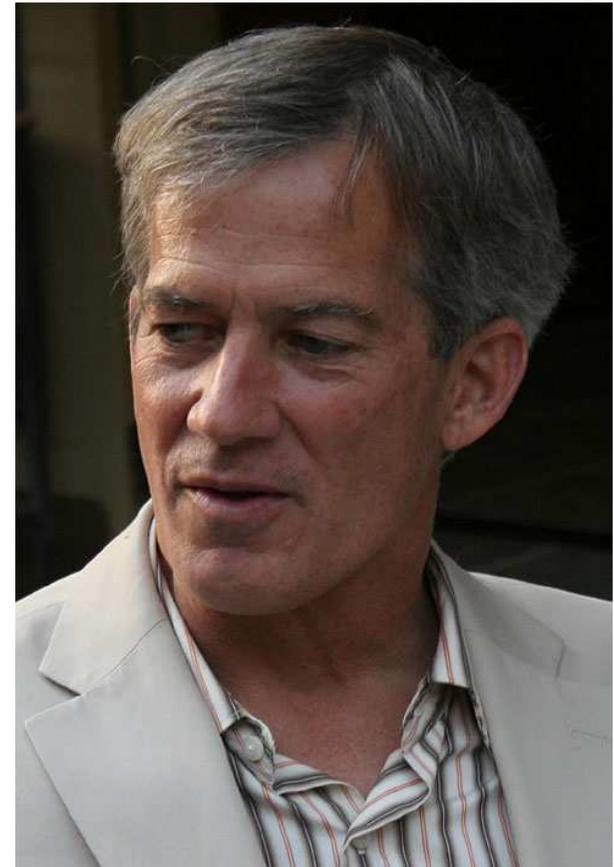
Is it that you are discouraged because you aren't making progress as quickly as you hoped?

Research in mathematics is *hard!*

Say you're a baseball player, and you're a really great batter. Your average might be 300, meaning 30% of the time you get a hit.

Well, as a mathematician, it's more like 1% of the time you get a hit.

-- Brian Conrey, Director of the American Institute of Mathematics, and Professor at the University of Bristol, and an advocate for diversity in the mathematics community



Some people love mathematics, are really good at it, but simply are not “hooked” by the research.

One friend of mine decided in high school that she wanted a PhD in mathematics. In the process of completing her thesis, she realised that what fascinated her was not the research itself, but rather the way mathematicians think.

For 12 years now she has been teaching and directing Business Calculus and Quantitative Reasoning / Mathematical Skills courses at the University of Colorado. She's spectacular at the job, and she is happy.

After my PhD, I was afraid I'd never have another idea, so I did not apply for research jobs. But in my first job, the winters in Minnesota were so boring that I started doing research again -- after that, I couldn't stop!



Minnesota in winter

It is important to find your **passions, and to pursue them.**

If you are **passionate** about mathematical research, what can you do to help advance yourself and your research?

Do you work on **ambitious** problems? Of course, this can be risky; it's good to have some problems that you know you can solve, yielding results that will be of interest to others, and to have some more **speculative** problems to think about, and, one hopes, eventually solve.

One has to have **time** to work on research, and this can be difficult with children, especially when they are really small. Peter Sarnak's advice: *Hire a babysitter! Hire a house cleaner, if you can afford it!*

One also has to have ideas and appropriate skills.

To get ideas, and to develop one's skills, one can work through interesting but difficult papers or books. Look at the papers posted on arXiv each week.

Co-authors can be invaluable. I advise you choose co-authors so that:

- Their knowledge and skills complement your own.
- You can comfortably think aloud and brain-storm with them.
- They follow projects to completion, and write the parts of papers assigned to them.

Network, network, network!

Take care writing introductions for papers and talks; you want to interest a broad audience. Many will only read or listen to the introduction, so strive to convince them right away that the problems are interesting, and that your results are significant.

Invite people whose work interests you to talk at your institution.

Go to conferences and talk to people. Some people will not be so friendly, but many will, especially when you express interest in their work (and often this leads to them asking about *your* work).

Volunteer to speak at conferences. Too few women do this! It is a good way to get your work better known, and it gives others the opportunity to come up and talk to you about your work.

Do not let fear stop you! When necessary, use **courage in place of **confidence**.**

BE AMBITIOUS!

Look for opportunities. With many conferences or workshops, you can apply to attend, and some institutions sponsoring workshops are serious about including women. (For instance, the [American Institute of Mathematics](#) insists their workshop organisers ensure that at least 20% of the participants are [women](#).)

Organise a conference or workshop, or a special session at a large national or international conference. (Easy at an AMS conference; might need a US-based co-organiser.)

Look for [funding opportunities](#) – and **apply!** Write your proposals with confidence; for example, use the word “**will**” rather than “**might**”.

As you become more ambitious and more successful, you are likely to experience increased **hostility** from some.

As well, not all women support other women, and organisations for women in mathematics are not always committed to supporting and promoting **women as leaders in research**.

However, support can come from unexpected places (such as men who have daughters, especially daughters at university).

Build yourself a network, nourish it, and let it nourish you.

Don't let fear keep you from what you love.

The woman who survives intact and happy must be at once tender and tough. She must have convinced herself, or be in the unending process of convincing herself, that she, her values, and her choices are important... She must resist considering herself a lesser version of her male counterpart.

-- Maya Angelou, from the essay **In All Ways A Woman**



Women in mathematics should be **VISIBLE!**

